ABSTRACT:

Early diagnosis through mammography screening is the most effective means of decreasing breast cancer mortality. While mammography is inexpensive, the interventional procedures that result from detected abnormalities (both false and true positives) increase the cost of this population-based screening program significantly. Breast biopsy is commonly performed on the suspicious findings on mammograms to confirm the presence of cancer. Up to 80% of these biopsies are performed on benign breast lesions, resulting in unnecessary treatments, patient-anxiety and expenditures. The objective of this research is to optimize the biopsy decisions for breast-cancer patients such that the early diagnosis of invasive breast cancer is improved while unnecessary procedures are minimized. The problem is formulated as a finite-horizon discrete-time Markov decision process (MDP) integrated with Bayesian networks. We perform a structural analysis of this MDP. The optimal policy shows that the decision to biopsy should depend on patient characteristics such as age and disutility of biopsy. In particular, our optimal policies suggest that as women get older they should be biopsied less aggressively. We compare our model to clinical practice and find that our model has a potential to improve breast cancer diagnosis significantly.

BIOGRAPHY:

Jagpreet Chhatwal works as a health economist with Merck Research Labs. He received his PhD from the University of Wisconsin-Madison in Industrial Engineering in 2008. His research interests include medical decision making, public health policy, sequential decision-making under uncertainty, and simulation modeling. He was awarded the George B. Dantzig dissertation award in 2009, and Best student paper awards from the Decision Analysis Society and, MSOM (Manufacturing and Service Operations Management) Society of INFORMS.

Refreshments will be served.